INSTRUCTIONS FOR INSPECTION

of

FROZEN ASPARAGUS

For Use Of USDA Processed Foods Inspectors

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH

PREFACE

These instructions are designed primarily for Processed Fruit and Vegetable Inspectors of the U. S. Department of Agriculture. They are not intended to be a comprehensive treatise on the subject but give background information and guide-lines to assist in the uniform application and interpretation of USDA grade standards and other similar specifications.

These instructions are revised as necessary without public notice and no mailing list is maintained as a public advisory of such changes.

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INSTRUCTION FOR INSPECTION OF FROZEN ASPARAGUS

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THIS INSTRUCTION SUPERCEDES INSTRUCTIONS DATED MARCH 1961, AS AMENDED

1. PRODUCTION

1.1 Pack Statistics

The reported frozen asparagus pack for 1968 was 34,355,000 pounds. The Western States account for approximately 75 percent of this production. Frozen asparagus ranks 14th in the reported volume of frozen vegetables packed in 1968. Of the total pack approximately 25 percent is "Cuts and Tips." Most of the pack is "Spears."

1.2 Producing Areas

California leads the country in production of asparagus. Here the major growing areas are in the reclaimed islands and lowlands of the Sacramento Delta area. This area is at the confluence of the Sacramento and San Joaquin Rivers. The light, easily worked peat soil of the area is adapted to the growing of the crop.

Next in importance is the Pacific Northwest, where most of the "grass" is grown in scattered valley areas east of the Cascade Mountains, in the southern portion of Washington and northern Oregon.

In New Jersey freezing of asparagus is restricted almost entirely to the southern areas.

In the Midwest limited amounts are frozen, principally in Michigan.

It is customary to mound the rows slightly before the tips emerge from the ground. Once a field is established it remains in full production from 10 to 25 years and there are even rare instances of as many as 50 years.

1.3 Cultural Types

Horticulturists classify asparagus varieties in two groups, based principally on color, namely:

Dark green color types such as those strains which date back to "Mary Washington" and "Martha Washington."

Light green color types which are of limited availability - practically all fresh market.

As with other vegetables, scientist have developed hybrids, most of which are numbered (e.g. Improved 500), and it is questionable if the exact type can be identified. For freezing purposes varieties with dark green spears are preferred. Often the tips are purplish green.

1.4 Color Types

The U.S. Standards classify frozen asparagus into two types based principally upon the amount of white color on the spear, namely -

Green or all green asparagus is green or yellowish green the entire length of the unit. Green asparagus generally has less fiber and heads are less compact than green-white.

Green-white - in which the units have a typical green color over most of the unit but are white in the lower portions of the stalk. This color type is restricted to the styles of Spears and Tips and is of negligible importance in the total picture of frozen asparagus.

Culturally - bleached (white) asparagus is not frozen.

1.5 Effects of Weather

Asparagus is more responsive to changes in weather conditions than most vegetables. Under conditions of high temperature and ample moisture, spears may grow several inches in a day. Such asparagus is tender and relatively free of fiber, but the percentage of open heads may be high. Low temperatures check growth and harvesting during cool weather is likely to show a high percentage of tough stalks.

Cool weather tends to discourage the development of asparagus beetles and reduces damage from this cause. Strong winds cause sand scars, increase the proportion of crooked spears, while heavy rains usually increases grit and sand in the heads and under the bracts.

1.6 Processing versus Fresh Market

Asparagus is often harvested both for the fresh market and for canning or freezing from the same field. The usual procedure in such cases is to harvest for the fresh market while prices are favorable and then switch to processing as supplies become more plentiful. In other cases fields are grown exclusively for processing, and no effort is made to sell to the fresh produce market.

In California, the general practice is to market the early portion of the crop in fresh form. Harvesting in the Delta area begins in February and cutting for the fresh market continues until early April. By that time Midwestern and Eastern harvests make shipment from California unprofitable. The California processing season lasts until the end of June. Most other producing areas end about this time too.

2. HARVESTING

2.1 Cutting

The usual harvesting practice is to cut the spear just below the surface of the ground with a chisel-like knife. Handfulls from adjoining rows are combined and picked up by a worker with mechanically drawn sleds or tractor mounted carts. The fields are worked every 2 to 4 days during harvest and a selection made of shoots that are suitable for processing.

Field snapping

Experimental work by the Michigan State Experiment Station has resulted in the practice of field snapping green asparagus. Instead of cutting the spear below the surface of the ground the picker grasps the spear and snaps it off at the point where it is tender enough to make a clean break.

Field snapping saves labor and requires less handling than customary methods, and almost eliminates the waste disposal problem since only usable asparagus is delivered to the processing plant.

Mechanical harvesting

While some progress has been made in mechanical harvesting, it is not yet a satisfactory method for asparagus.

2.2 Importance of speed

The quality of asparagus deteriorates rapidly after cutting. Spears develop fiber, and may wilt or shrivel; heads of green asparagus start to open. Asparagus should be hauled to the processing plant and processed with the minimum of delay. For long hauls or unavoidable delays the "grass" is usually iced or **hydrocooled to maintain quality.**

2.3 Field Washing

In some areas and frequently in California, Washington and Idaho the harvested asparagus is hauled to a packing shed in or near the field. Here the shoots are cut to a uniform length of about 7 to 9 inches, washed and placed in field lugs. It is further prepared for the haul to the processing plant by water spraying, hydrocooling or icing.

2.4 Contracting

A number of packers grow part or all of their own supplies of asparagus on their own land. Most processors, however, purchase from growers on contract. Since there is potential for

a large amount of waste on field run grass, contracts have become rather explicit in defining acceptable quality. Most California contracts specify a maximum spear length, usually 7 or 7-1/2 inches. In some areas, growers deliver 7 to 9 inch green spears.

Most contracts contain provisions against the delivery of asparagus with crooked, spreading, or broken tips or showing excessive damage by beetles or other cause. Some contracts specify a minimum spear diameter. In most cases waste material from each grower's deliveries is weighed and deducted from the total delivery weight.

Where field-snapped asparagus is purchased, there is usually less waste to be charged against the grower.

2.5 Raw Material Inspection

In some cases deliveries are inspected by State inspectors to determine the grade of each load on the basis of State grades. Processors may also purchase asparagus on the basis of the United States grades for processing, subject to inspection at time of delivery by a Federal-State inspector. The inspector determines the percentage of No. 1, No. 2 and culls in the load. White butts in excess of the amount permitted are cut off and weighed in with the culls. The grower is then paid the contract price for the No. 1's, a lower price for the No. 2's, and nothing for culls.

Processed Fruit and Vegetable Inspectors on In-Plant assignments should make general observation of the quality and condition of the raw product intended for processing. However, they should not attempt to establish the grade of the raw product or enter into a discussion between the processor and the grower in regard to the quality of the raw product.

3. PROCESSING AND FREEZING

3.1 Holding

When deliveries are irregular, some asparagus may be held for several hours to a day or more before freezing. Some packers manage to keep sufficiently caught up with deliveries so that special steps to prevent deterioration of the raw material are unnecessary.

If there is any unusual delay in handling the asparagus or if conditions warrant various methods are used to maintain quality - - refrigerated rooms, cold water tanks, wetting down with a cold water spray, piled or covered with crushed ice, or by hydrocooling.

3.2 Preparation Steps

The sequence of preparation for freezing varies from plant to plant but consists of several operations including washing, trimming, sizing, sorting, cutting, blanching and packaging. In some plants much of the operation is substantially automated, whereas in others some of the steps are essentially by hand. The operations described in the remainder of this section are typical but not necessarily in the same order in every plant.

3.3 Washing

The asparagus is dumped from lug boxes into a large tank of water agitated with high pressure sprays in order to remove as much grit and dirt as possible. The washed product is fed out of the end of the tank onto a broad, mesh belt and then up to the top of diverging roller sizers.

3.4 Preliminary Sizing

Roller sizers are set to remove the No. 1 or "Pencil" grass which is either discarded or more likely diverted to "Cuts and Tips" style.

3.5 Cutting

The dewatered asparagus from the roller sizers is passed over a shaker which helps align the units and then onto a cutting table belt where the units are placed in slots with heads in one direction. The belt then conveys the product through a circular knife or saw where the butt ends are removed and the edible portion cut to a specified length.

In some plants the grass goes to the cutters before the washing operation. Another type of cutting belt consists of two

belts placed approximately 90 degrees to each other. The surface or horizontal belt is tilted at a slight angle away from the workers. The vertical belt -- at approximately 90 degrees to the horizontal belt -- serves as a stop for the asparagus heads. Both belts travel at exactly the same speed.

Women take asparagus from the boxes by handfuls and place it on the horizontal belt, gently pressing the heads against the vertical belt. The asparagus may be stacked two to four inches in depth. The belts convey the asparagus into cutting saws which may be in the form of a circular saw or band saw. The saws are spaced at varying distances from the vertical belt to give the desired length of cut. The first saw removes the butt end of the asparagus which is discarded. The second cut ranges from one to two inches and is saved as "Center cuts" for Cut Asparagus style.

When Spears are packed, generally only two cuts are made. The second cut leaves a spear of the desired length for the container size.

When Tips or Points are packed, a third cut may be made at the base of the shoot. This bottom portion is blended in with the cuts and tips to regulate the percentage of head material. The remaining top portion is used for the Tips or Points pack.

When Cuts and Tips or Cut Spears are packed the units sorted out from the regular Spear or Tip pack are diverted to a cutter which is generally of the Urschel Bean type cutter. The units for this style generally consist of the "Pencil" grass sorted out from the larger sizes, misshapen spears, open heads, damaged spears, etc. blended with field run asparagus. The usual length for this style is 3/4 to 1 1/2 inches.

3.6 Washing

Following the cutting operations the prepared asparagus is usually carried by conveyor belt or flume to the washer. Flume conveyors are frequently used because they cause less injury to the tender tips. In a typical operation the spears are washed in a tank of warm water (115° to 140° F.) then carried under a strong spray. The warm water causes the bracts of the head to expand slightly, making it easier for the sprays to dislodge any grit that might be present.

3.7 Sizing and Grading

Spears and Tips

Sizing and grading for defects may be done at the same time. Small, crooked, short, or otherwise unusable spears are sorted out and sent to the cutters for preparation as Cuts. Spears

are separated by hand based on appearance as to size and packed into cartons according to size.

Cuts

Asparagus not selected for Spears and Tips is diverted to the cutters without further sizing or sorting except to remove the more severe type of defects.

3.8 Blanching

Asparagus is blanched before freezing to inactivate enzyme systems. Blanching, either water or steam, also partially opens the bracts so that any remaining grit may be removed in the subsequent washing.

In the flume type hot water blancher, the asparagus is carried through by movement of the water, which gives considerable washing action.

Blanching temperature is thermostatically controlled and maintained at approximately 190° to 210° F. Overblanching causes the asparagus to turn a brownish color. Underblanching may cause a "hay like" flavor to develop over a long period of storage.

Separate blanchers are often provided for Spears and Tips as is for Cuts. Time is also varied depending upon the size of the units.

3.9 Cooling

The blanched asparagus is cooled rapidly by dumping into a cold water flume, subjecting to cold water sprays or a combination of the two. It is essential to stop the blanch at the desired point to preserve color and not "overcook" the product.

3.10 Packaging

The blanched, cooled asparagus passes over a final dewatering shaker and then on to the packaging table.

Spears and Tips are hand packed into retail or institutional type cartons.

Cuts or Cuts and Tips are for the most part packaged by automatic filters.

The common retail size cartons are 8, 9 and 10 ounce whereas the institutional pack is 2 or 2 1/2 pound. Currently there is a move to bring about fewer and more standardized retail carton sizes.

3.11 Check Weighing

The packed cartons are check weighed prior to freezing - such check weighing may be 100 percent of the production or it may be on a spot check basis. In many plants all the Spears and Tips styles are subjected to 100 percent sampling whereas Cut Spears are on a spot basis.

3.12 Freezing

The packaged product may be frozen by various methods. However, "tunnel freezing" is the most common. The cartons are placed on trays and racks and wheeled into a tunnel and subjected for a few hours to a blast of air at a temperature of minus 10 to minus 40 degrees F. Plate freezers are also being used. The newest installations have automatic, continuous plate freezers.

3.13 Storing

After freezing the cartons are packed in corrugated fiber cases which are sealed and stored in a freezer room at 0 to minus 10 degrees F. until ready for shipment. Storage temperature should not rise above 5 degrees F. Some state regulations and buyers' specifications may require lower storage temperatures.

3.14 Waste Disposal

The amount of waste asparagus material depends largely upon the amount of sorting and trimming done at the field station. In some cases it may be as high as 40 percent of delivered weight and consists essentially of butts and inedible material. Solid wastes may be collected and hauled away for disposal by ploughing into the soil; or, it may be ground to a slurry and disposed of through sewer facilities.

Experimental work has been done on utilization of this waste but little commercial use has developed.

4. INSPECTION AND GRADING

4.1 General

The current issue of the United States Standards for Grades of Frozen Asparagus is an "Attribute Type" Standard -- i.e., it is based on a go or no go acceptance procedure; deviations in the characteristics that denote quality are classified as minor, major, severe, or critical depending upon seriousness of such defect. The "defects" are then tallied, compared to acceptance numbers and the sample is either Grade A or it fails Grade A, with no score points to indicate the relative degree of excellence.

By contrast most U.S. Standards for processed fruits and vegetables are built around a numerical scoring system, whereby not only is each factor given a rating, but a score is also assigned to the sample as a whole. To illustrate -

Color - 18 points (out of a possible 20 points)
U.S. Grade A - Average score 95 points (out of a possible 100 points)

Standards of this type encompassing a scoring system are sometimes referred to as a "Variable Type" standard. Not only is the Sample Grade A but it has a relative position of 95 points out of a possible 90 to 100 points.

4.2 General Format

Variations from the quality requirements (color, sizing, workmanship, damage, texture, HEM) are individually classified as "defects". Additionally, these "defects" are described and categorized as "minor", "major", "severe", or "critical", depending upon the seriousness of the defect. The sampling plans in the standard are based upon "defects per hundred units" rather than "percent defective". Under the DHU (defects per hundred units) principle, a unit may be scored more than once; for example, a spear may be (1) a minor color defect; (2) a minor length of unit defect; (3) a major tough fiber defect; and (4) a severe discoloration defect -- in which case instead of having only one defective unit there might be:

2 minor defects
1 major defect
1 severe defect
4 total defects - all on one spear

The allowances for the various defect classifications, which are given as cumulative acceptance numbers, are statistically geared to specific acceptable quality levels (AQL's) and sample unit size. Therefore, any change in AQL's or sample unit size will require a corresponding change in the sampling plans (acceptance numbers). Also in the application of the standards, a change from the intent of the original design, specifically with respect to how defects are counted, will result in a change in the AQL's and the sampling plans will not be applicable.

Inspectors must therefore follow the standard and the procedures outlined in the instruction in order to evaluate the product within the intent of the grade standards.

An exception to the foregoing is Buyer Specifications, in which different AQL's are specified or defects classified differently. As is customary, inspection and certification cannot be made on these "buyers' specs" unless a copy is available to the inspector and tables of acceptance numbers for specified AQL's included with the specification.

4.3 Equipment, Inspection Aids, and Instructions

1) General -- as in File Code 130.

2) Specialized (for Frozen Asparagus)
   USDA Frozen Asparagus Size Gauge.
   USDA Photographic Plates 1, 2 and 3, showing Stages of Development.
   USDA Photographs illustrating defects of workmanship, damage, discoloration, etc.
   Defect Tally Sheet or Control Charts.

4.4 Arranging Sample Units and Recording Information

As in File Code 130.

4.5 Net Weight

As in File Code 130.

4.6 Condition of Frozen Product

Follow File Code 130 with special emphasis, in the case of Spears and Tips, on the incidence of shattered or broken units. Examination of the product in the frozen state will generally give sufficient clues as to whether any broken units might be the result of rough handling after freezing. It would then be important for the inspector to be sure that his sampling and handling procedures did not contribute to the broken or shattered units.

4.7 Thawing

The product may be thawed in either of the following ways:

1) Air thaw the product, in its container, at room temperature.

2) Water thaw placing the product in its container or on a screen of suitable size under a fine spray of water. The water temperature should not exceed 86° F.

REGARDLESS of the method used to thaw the product -- Size must be determined just as soon as the units are readily separable and the sample units selected for product evaluation.

Insects or extraneous material remaining in the water used for thawing should be recovered and evaluated as a part of the sample unit.

4.8 Obtaining Random Sample Unit

Follow the random selection procedure outlined in File Code 130 in obtaining the proper sample unit in relation to Styles as --
- - - For Spears and Tips - 50 units
- - - For Cut Styles - 100 units

4.9 Color Types

The U.S. grade standards for frozen asparagus provide for two color types -- Green or All Green, and Green-White. The Green-White color type applies only to the styles of Spears and Tips. White or yellowish-white units in the Cut styles are considered color defects.

Practically all of the asparagus frozen is of the All Green color type. Therefore, seldom will the inspector have to make a decision as to whether or not the product complies with the criteria for Green-White. Unless the product is actually labeled or offered as Green-White consider the product as All Green color type.

When asparagus is declared or offered as Green-White type it should possess a substantial number of spears or tips that meet the definition for this type. This means that the number of all green Spears or Tips present do not exceed the acceptance values for AL (absolute limit) and for the sample size in Table I of this Instruction. If the product fails to meet this criteria, it should be considered as All Green color type and graded accordingly.

TABLE I
COMPLIANCE WITH GREEN-WHITE COLOR TYPE

In any sample unit (AL) 1/ 15		
Number of Sample Units	Number of Spears or Tips	Maximum No. All-Green permitted
1	50	12
2	100	21
3	150	30
4	200	39
5	250	47
6	300	55
7	350	63
8	400	72
9	450	80
10	500	90
11	550	96
12	600	104
13	650	112
14	700	121
15	750	129
16	800	140
17	850	145
18	900	153
19	950	161
20	1000	169
21	1050	177

1/ In any sample unit, except the first one of 50 units.

4.10 Styles

Record the style of the product on the score sheet or tally sheet.

In the case of Cut Spears determine the percent of "head material" on the basis of the 100 unit sub and record this information in the appropriate space.

Follow the requirements of the standard regarding the amount of head material required in Cut Spears, depending upon the length of the cut -- namely,

TABLE II

Length of Cut	Sample Average (Minimum)	Individual Sub (Minimum)
1-1/4 inches, or less	18%	12%
Longer than 1-1/4 inches	25%	15%

In separating head material, keep in mind that a piece or unit of head material is --

1) A tip end of a shoot which is 3/8 inch or more in length;

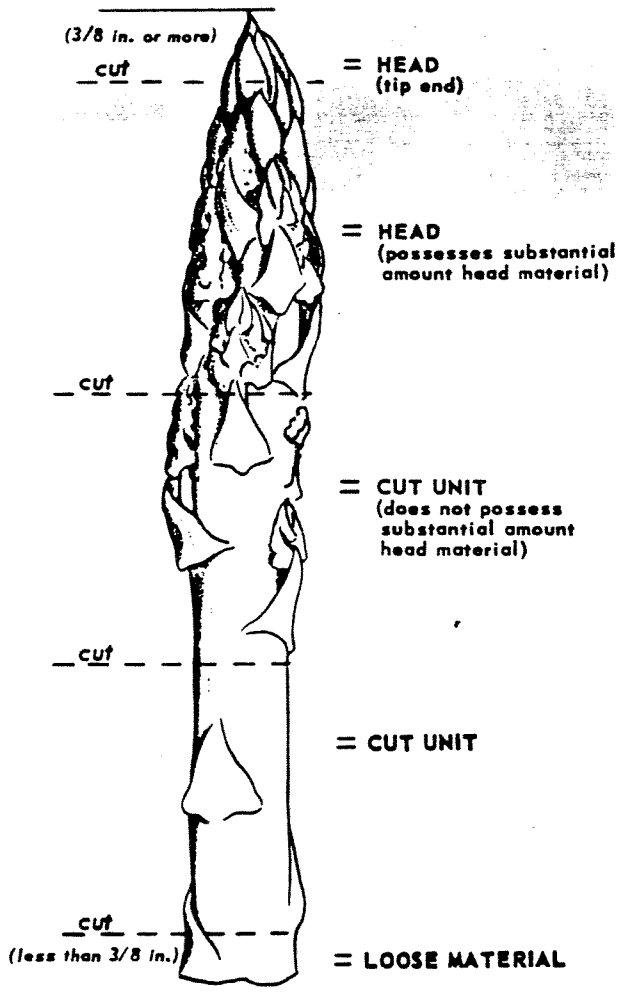
2) An upper portion of a shoot that contains a substantial amount of compact head material.

"Substantial Amount" means approximately 75 percent or more of the apparent original head portion of the shoot. A few bracts staggered down a portion of the cut does not qualify such unit as "head material."

For visual illustrations of heads or head material, cuts and loose material, refer to the accompanying sketches 1 and 2 on the following page.

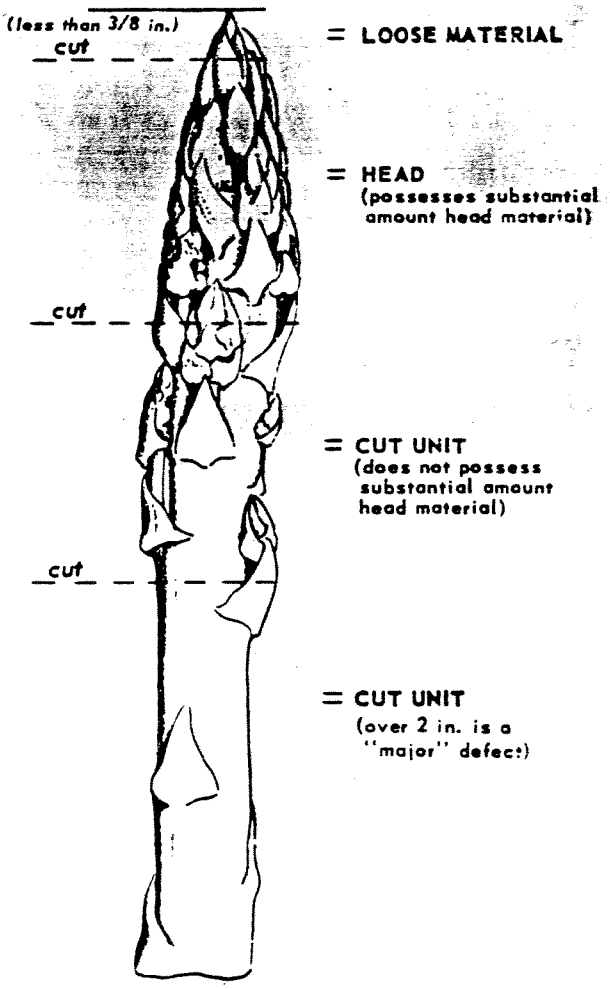
FROZEN ASPARAGUS CUT SPEARS (GREEN OR GREEN-WHITE TYPE)

Definition of Terms



1.

In determining the percent, by count, of heads, a tip end that is 3/8 inch, or more, in length is counted as one head.



2.

If a portion of a spear possesses a substantial amount of head material, it is counted as one head.

4.11 Size Determination

General

The United States Standards for Grades of Frozen Asparagus include size designations for Spears and Tips (as applicable) and state the manner in which size (diameter) is to be determined. The U.S. Department of Agriculture has developed a device to measure and classify the size (diameter) of such units.

The USDA Asparagus Sizer consists of a white, opaque plexiglass plate (3" x 8") with a "V" shaped notch extending lengthwise. One side is marked for frozen asparagus; the other side is marked for canned asparagus. The right-hand edge of the "V" on each side of the plate includes the diameter dimensions for the respective size designations. The diameter dimensions imprinted on the sizer is the width of the "V" at the point indicated by the dimension. One edge on each side is marked off in 1/4-inch graduations for measuring the length of the asparagus units.

As has been pointed out earlier in this handbook, size determination of Spears and Tips should be made as soon as possible after the units are thawed to the extent they can be separated....otherwise the shoots lose rigidity and are more difficult to restore to their original conformation for proper measurement.

How to use the Asparagus Sizer

In ascertaining the sizes present in any individual sample unit, it should not be necessary to make actual measurements of each unit. Separate the units according to diameter, placing those units that appear to be of the same diameter together. Measure only two or three units from each size group thus formed to establish the various sizes and percentage of each that may be present. Increase number checked when borderline. The diameter measurements are made with the USDA sizer as follows:

1) Use the same sample unit as taken for quality determination, unless separate in-line control is in effect for size only.

2) Use the side applicable to the frozen product.

3) Insert the asparagus unit into the "V" so that:

   a) The asparagus unit length is approximately at right angles to the sizer.

   b) The greatest diameter of the asparagus unit after being restored to its original shape is approximately parallel with the end of the sizer; and

   c) The point of measurement on the asparagus unit is at the

point of maximum diameter, regardless of the length of the shoot.

4) Move the asparagus unit down the "V" until the unit barely makes contact with both sides of the "V." Do not force the unit beyond this point.

5) Classify the unit as to the size designation -- stated between the diameter divisions -- with which the unit falls.

Example:

If a frozen asparagus spear, when measured as prescribed herein, falls between the diameter divisions of 3/8 inch and 5/8 inch, the spear is classified as "medium" size.

6) In a borderline measurement, where the approximate center line (diameter) is on a dividing line between two size classifications, consider the unit as the larger size.

Example:

When the diameter of a frozen asparagus spear is on the 5/8-inch mark, the unit is considered as "large" size.

4.12 Size Compliance

General

Follow the requirements in the grade standards very closely in ascertaining compliance with sizes. Note that several options are provided, namely --

1) A single size.
2) Blends of two adjacent sizes.
3) Blends of three adjacent sizes.
4) Mixed sizes.

Table I of the standards provides diameters for the respective single sizes according to word or number designation.

Table II of the standards specifies "defects" as may be applicable for a particular single size or a blend of specified sizes. Note that these deviations are classified as either Minor, Major, or Severe, except that for "Blends of Sizes" a "defect" can only be Minor.

Table III contains the acceptance criteria for Single Sizes and Blends of Sizes according to sample size and the number and type of defects present. Note that the right hand column applies to Blends only.

Single Sizes

Acceptance criteria is illustrated by the following example:

Example 1 (Medium Size Declared)

Sample size 300 spears.

Small	-	10 spears	-	Major defect
Large	-	11 spears	-	Minor defect
Extra Large	-	9 spears	-	Severe defect
Total :		30 defects.		

The sample as a whole meets the criteria for Medium size, since in a sample size of 300 spears there would be allowed 32 Major defects, 12 Severe, and 55 Total.

Example 2 (Medium Size Declared)

Sample size 300 spears.

Defects in the same number as in Example 1, except that in sample unit #3 there are 6 Severe defects.

In this case the lot fails to meet the declared Medium size since the AL is exceeded for individual sample units. Sample Unit #3 is "Mixture of Sizes -- Medium and Extra Large."

Blends of Sizes

Two combinations for "Blends of Sizes" are provided for in grade standards. One combination is for a blend of two adjacent sizes; the second is for a blend of three adjacent sizes. Acceptance criteria is provided in Table III and in § 52.391 in the same manner as for single sizes.

If a sample is found to fail requirements for a blend of two sizes but meets requirements for a blend of three sizes, the lot is to be considered as the latter and certified as such. If a sample is found to fail the criteria for either a blend of two or three sizes, the lot is considered as "Mixture of Sizes."

Example 3 (Lot Declared as Medium-Large Blend)

Sample size 400 spears.

Small	-	24 spears	-	Minor defect
Extra Large	-	8 spears	-	Minor defect
Total	:	32 minor defects.		

The sample as a whole meets the criteria for Medium-Large Blend, as Table III permits 41 defects for a sample of 400 units.

Mixed Sizes

If the sample does not meet the criteria for either a single size or blends of sizes, it automatically falls into the category of Mixture of Sizes.

5. QUALITY FACTORS

5.1 Prerequisites

Certain product characteristics and extraneous materials that are not readily measurable are not included in the tables of "Classified Defects" but are nonetheless important in the assessment of overall quality. Specifically, these are --

Flavor and odor.
Grit, silt and earthy material.
Similar varietal characteristics.
Overall appearance.
Loose material - measurable by weight.

The prerequisites for both Grade A and Grade B are that the product possess a good flavor and odor and be free from grit, silt, or other earthy material, and be of similar varietal characteristics. In addition, in Grade A the product must have an "attractive appearance," whereas in Grade B it need be "reasonably attractive." Also, in both grades there is a 5% and 10% limit, respectively, for "loose material". "Good flavor and odor" means that the product possess a flavor and odor of asparagus, before and after cooking, that has been properly prepared from freshly harvested asparagus, including proper blanching, proper freezing and proper handling in accordance with good commercial practice. The product must be free from off-flavors and odors of any kind such as hay-like flavors or odors. If the product possesses an objectionable flavor or odor (one which would likely cause the consumer to discard the product as for example sourness) it should be considered Substandard.

"Free from Grit, silt or earthy material" means that the product should not contain any of this material that is readily visible or readily noticeable upon chewing. Asparagus is sometimes raised on peat soil and if not thoroughly washed may sometime carry over a little peat. Heavy wind may imbed particles of sand in the shoot and under the bracts, making removal most difficult. During examination of the sample check carefully for visual extraneous matter. Also, check the cooked product for presence of grit or sand by chewing suspect portions of the product. If upon visual observation and the chewing test extraneous matter or sand is more than slightly noticeable, the product is classified as "Substandard, account grit" -- or whatever the reason may be.

"Similar varietal characteristics" means that the asparagus shall be of similar color types, although there may be variations within such color types. Seldom would this requirement be a

Change.

problem. An extreme example of "dissimilar varietal characteristics" would be a mixture of All-Green and Culturally Bleached units.

"Overall appearance" -- whether attractive or reasonably attractive is a control that might be used to take care of any unusual characteristic that would so affect the overall appearance as to make the product undesirable for the indicated grade, even though the sample would meet all of the objective criteria for "Classified defects."

"Loose material" means any shattered material and cut or broken pieces that are less than 3/8 inch in length.

5.1.1 Determination of Loose Material

For this characteristic the determination is made on a sample weight basis and not on a standard sample unit of 50 spears (or 100 cut spears). The most practical way to handle the requirement is to separate the shattered material and small pieces from each container and weigh the material on a gram scale. An alternative is to collect all the loose material from all of the packages in the sample and make only one weighing. This may be done since the requirement is on the basis of sample average and not on individual sample units.

For in-line control it would be desirable to record loose material in order of production if this type of defect is a problem.

In the case of institutional size packages of Cuts or Cuts and Tips it would be satisfactory to take a well mixed sub of 10 ounces from each package and base loose material on the total of such 10 ounce subs.

5.2 Classified Quality Factors

Quality factors for which defects are classified by degrees of severity are Color, Uniformity of Length, Character, Damage, and Harmless Extraneous Vegetable Material.

5.2.1 Color

The normal color of frozen asparagus after thawing is:

Green or all-green -- bright green or purplish green, with no tinges of gray or olive colors.

Green-White -- the same as green except that white or yellowish-white areas extend up the stalk from the cut end.

A grayish or olive coloration in frozen asparagus may be caused by overblanching, improper cooling after blanching, or holding too long prior to freezing, as well as other causes. Asparagus spears affected in this manner should be considered a major or severe color defect, depending upon whether the appearance of the unit is more than slightly but not materially affected (Major) or materially affected or worse (Severe).

Other color defects are described and classified in the grade standards, Table IV. Note that there are no "Minor defects" for color. They are either "Major" or "Severe". Furthermore, in the case of All-Green Spears and Tips, any white color not exceeding 1/4-inch is disregarded.

5.2.2 Uniformity of Length

Defects for this factor are described and classified in the grade standards, Table IV. In the case of Spears or Tips, the sample unit is laid in a single layer and single row. All the heads or all the cut ends "preferably cut ends" should be even. This may be done quickly by placing the heads or cut ends against a straight edge of some type. An estimation of length is then made from the approximate average length of all of the Spears or Tips with the most uniform lengths. Spears or Tips that vary more than 1-1/2 inches from this approximate average length are considered a Minor defect. Misshapen units should be straightened when determining the length.

In the case of cut styles, units less than 1/2 inch (excluding head material or loose material) or more than 2 inches are considered defects for these styles, as classified in the standard as "minor" and "major" respectively.

5.2.3 Character

The factor of character is a combination of: a) development characteristics, and b) tenderness, fiber development.

5.2.3.1 Development

Photographic illustrations of defects with respect to development for the factor of character are included in the grade standards.

Photos 1 and 2 of Plate 1 illustrate the bottom limits for "well developed" heads and are not considered defects. Note that growth has progressed to the point where seed development has just begun. The lower bracts are slightly elongated but the heads are still tight.

When the growth of the asparagus has progressed beyond the spears illustrated in Photos 1 and 2 of Plate 1 but not beyond the spears illustrated in Plates 2 and 3, they are considered "reasonably well developed." Photos 3 through 10 in Plates 2 and 3 are considered the maximum limits for "reasonably well developed." Note the seedy appearance of the heads. The bracts have elongated to a point that gives the head a slightly loose appearance. The bracts at the tips, however, are still fairly compact. Also, note the slightly sparse appearance of the heads of Photos 5, 6, and 8.

Reasonably well developed asparagus is considered a defect in Grade A only. One hundred percent of such units is permitted in Grade B.

When the development of the asparagus has progressed beyond that illustrated in Plates 2 and 3, the heads may appear more seedy and the bracts will be more elongated producing a rather loosely structured head. Such asparagus is considered "poorly developed" and is a defect in both Grade A and Grade B.

5.2.3.2 Tenderness and Texture

The tenderness and texture of frozen asparagus is affected by the presence of tough, inedible fibers. The development of fiber in asparagus is to be anticipated when the raw product is held in the field or processors' storage for any appreciable period of time. Slow growing due to weather conditions may also affect the amount of fiber in the raw product.

The tenderness of frozen asparagus may be determined by chewing, the fork test, and/or by manually feeling the ends of the units. It should be noted at this point that the presence of fiber is of concern throughout the entire length of the unit.

1) By rubbing the thumb or finger across the end of cut surface it is possible, with a bit of experience, to detect the pres-

ence of fibrous material, or suspected fibrous material. When a suspected unit is found in this manner it should be set aside for further examination by the fork test and chewing.

2) The fork test (after cooking) is accomplished by severing the unit with a rocking action of a fork when moderate pressure is applied. The asparagus should cut through if no tough fiber is present.

3) Chewing (after cooking) is the final determination of the presence of fiber in all cases. It is very possible to find units that feel fibrous or are not completely severed in the fork test that do not possess tough fibers. Units that chew without material noticeable fiber are not considered a defect.

Follow the classification criteria as specified in the grade standards, Table V , tough fiber development.

Keep in mind that a single unit can be scored twice for "Character defects." For example, a spear may be "poorly developed" and be a "Major" development defect. The same spear may have tough fiber and be a "Severe" fiber defect. The spear would be classified as one Major and one Severe defect under the character factor.

5.2.4 Damage

Various types of damage are classified according to the degree to which the appearance or edibility of the unit is affected. Under this factor there are four (4) sub headings or sub classifications.

1) Shattered Heads
2) Misshapen
3) Poorly Cut
4) Discoloration, Mechanical Injury, Pathological Injury, Other.

Visual illustrations of selected "damage defects" have been prepared in the form of colored photos. A key accompanying each set of the photos gives a brief explanation of each defect illustrated as well as the classification for the defect.

The sets of color photos will be given limited distribution until such time as more sets are available. They will be available for review in USDA inspection offices involved in the inspection of frozen asparagus.

* Change.

Shattered heads -- To be considered a defect the head should be shattered or broken to the extent that the appearance of the unit is materially affected.

Misshapen -- Only spears or tips which are seriously affected in appearance by doubles or by crooked units, or other malformations should be scored as a defect.

Poorly cut -- Consider as poorly cut units only those units which have very ragged, stringy, or frayed edges or a unit that is only partially cut or cut at an angle of less than approximately 45 degrees.

Other types of damage -- Other types of damage listed in the grade standards include discoloration, mechanical injury, pathological injury, or damage by other means. Although these types are listed and classified together, it is the intent to consider each a separate defect when they are non-related. If they are related defects, or if one cannot make a clear distinction as to cause, consider the damage as one (1) defect. For example a unit may be gouged on the stalk and also have considerable insect damage on the head. In this case the damage is non-related and the unit is considered two defects. In another example the stalk may have a discolored growth crack and in the same area have rust. In this case it is difficult to determine whether or not the two conditions are related and consequently the unit should be scored as one (1) defect only. Inspectors should use discretion in scoring a unit more than once for the factor of "Other Types of Damage".

5.2.5 Extraneous material

Various types of harmless extraneous vegetable material most commonly encountered in frozen asparagus are classified for defects by length.

If more than one type of harmless extraneous material occurs in one sample unit, they are treated as separate defects according to their length. More than one piece of a single type, however, should be treated as a single defect according to the aggregate lengths of the pieces.

5.2.6 Wholesomeness

As is customary in grading processed products, inspectors should be alert for foreign matter during examination of the asparagus. This includes but is not limited to extraneous material such as wood splinters, paint flakes, weeds, insects, etc. Ordinarily, careful macroscopic or "eyeball" examination is sufficient to detect this type of material. However, when circumstances warrant (as for insect recovery) extraction, filtration and microscopic examination should be used to determine extent of contamination.

6. RECORDING DATA

Inspection data may be recorded on either a Defect Tally Sheet or a Control Chart. The Defect Tally Sheet is designed to facilitate recording detailed information with respect to the findings in a sample of frozen asparagus. This tally sheet is to be used in all cases for lot inspection and may be used in in-plant inspection. The basic purpose of the control chart is to serve as an aid to production personnel for process control.

Although a Key of Abbreviations for various types of defects is provided for Control Chart use, the detailed information is not as readily detectable as with the tally sheet. However, when a particular type of defect becomes troublesome, it may be desirable to set up a separate control chart with predetermined limits for that defect only.

6.1 The Defect Tally Sheet

After the sample unit has been selected all defects are counted, properly classified, and tallied on the tally sheet. The following is a simple routine procedure that may be used:

6.1.1 Size Designation

1) Sample Unit No. 1.

   a) In the case of spears or tips count the number of defects that may be present for size (diameter).

   b) Record the number of each defect class in the appropriate space on the tally sheet opposite "Size (diameter)".

   c) Bring these same values down in the space immediately below opposite "Cumulative Total" (each class).

   d) Add the total number of defects found for all classes and record opposite "Total (all classes)".

   e) Record the value found in (d) above in the space opposite "Cumulative Total".

2) Sample Unit No. 2.

   a) Repeat steps 1 a and b.

   b) Add the number of minor found in sample unit No. 2 to the number of minor found in sample unit No. 1 and record in the Minor box opposite "Cumulative Total" (each class) under sample unit No. 2. Do the same for major and severe.

   c) Add the total number of defects found in sample unit No. 2 only and record opposite "Total (all classes)" under sample unit No. 2.

d) Add the total of all classes recorded for sample unit No. 2 to the total of all classes recorded for sample unit No. 1 and record opposite "Cumulative Total (all classes)" under sample No. 2.

3) Subsequent sample units.

The same procedure is used for subsequent sample units as for sample unit No. 2 except that the total values of sample unit No. 3 are added to the cumulative total values of No. 2, those of No. 4 to No. 3 and so on.

6.1.2 Classified Quality Factors

Defects in this category of Quality Factors include Color, Length, Damage, Character and HEM. Such defects are classified according to seriousness into either Minor, Major, Severe, or Critical classes by use of objective measurements, photographic illustrations, descriptive terminology or other applicable tests. At the completion of the examination of each sample unit the "defects" are recorded on the tally sheet in the appropriate boxes. The Cumulative Totals and Totals need not be completed until the examination of all sample units is complete except that if the tally sheet is being used for in-line control the entries should be completed as the inspection progresses.

In recording and adding up the totals and cumulative totals follow the same procedure as was illustrated for Size defects.

7. COMPLIANCE CRITERIA

Criteria for compliance with requirements for size designations and grade are specified in the frozen asparagus grade standards. Persons using these standards especially for process control purposes should be thoroughly familiar with the acceptance criteria so that trouble spots may be readily recognized.

On-line acceptance criteria for a specified size and for quality are as follows:

1) The number of defects of the various classes in the first sample unit does not exceed the acceptance number specified for "total sample." The values for "total" apply to minor defects as well as the sum of minor, major, severe, and critical defects.

The AL (absolute limit) is not applicable to the first sample unit.

2) The number of defects of the various classes in the second and each subsequent sample unit does not exceed the AL Value for the applicable class.

3) The cumulative number of defects for each class does not exceed the cumulative acceptance number for the total sample size for the applicable defect class.

4) The cumulative total defects, Minor plus Major plus Severe plus Critical, does not exceed the cumulative acceptance number for the sample size.

5) The amount of "loose material" does not exceed the allowance for the grade.

6) The flavor and odor is normal.

7) Varietal characteristics similar.

8) Sand, grit and silt within grade limits.

9) The product is wholesome and does not contain foreign material.

10) The overall appearance is satisfactory for the respective grade.

Change.

If an individual sample unit fails the AL, the subcode represented is rejected; however, cumulative totals continue for subsequent sample units. If cumulative defects exceed the limitations for either critical, severe, major, or total defects, the subcode represented is rejected. If the processor agrees to segregate Grade B production from previous Grade A subcodes and continue with the same intended Grade A quality and a new subcode, cumulative totals in the new subcode will continue from the last sample unit of the last Grade A subcode. Otherwise it must be assumed that the intended quality is Grade B and cumulative totals are continued using limits for Grade B. Failed subcodes are not resampled for acceptance.

Lot acceptance criteria for a specified size and for quality are essentially the same except that only the cumulative limitations for total number of sample units (3, 6, 13 etc.) and the AL are applicable. For example, if 3 severe defects were found in each of the 1st 2 of 3 sample units and 1 in the last, the lot is acceptable since the total of 7 does not exceed the limit of 7 for 3 sample units even though the limit of 5 for 2 sample units is exceeded. This is because the order of production is not known. If the AL is exceeded in a sample unit the code represented is failed even if the cumulative totals for the sample are not exceeded. Unless it is segregated, the lot fails.

8. THE CONTROL CHART

8.1 General

The sample control chart accompanying this instruction illustrates a typical control chart on which numbers of defects may be recorded and plotted for process control.

Some packers may choose to furnish their own control charts designed to suit their particular needs. Buyers of frozen asparagus may also wish to furnish their own control charts designed to fit their specifications. In any case, the basic design of the defect control chart is the same. The principle difference would entail the amount of information desired on the chart or the use of different AQL's which would require different AL values.

On the sample control chart the top portion is devoted to size designation (single size only). In this case there is no control chart involved since space would permit only the recording of numbers of defects. The procedure of recording the numbers of defects and carrying out the cumulative values is the same as that explained for the Tally Sheet except that no separate space is provided for Minor defects. The number of Minor defects found is added to the numbers of Major and Severe defects and recorded as Total.

The lower portion of the control chart is devoted to the quality factors. Since the frequency of occurrence of critical and severe defects is expected to be rather low, these two classes are not set to a control chart. The numbers of defects for these two classes and their cumulative values are recorded in a similar manner as explained for the Tally Sheet.

8.2 Plotting

The Major and Minor quality defects are counted and recorded and plotted as follows:

1) Record the number of Major defects for each sample unit in the box opposite "Ind." (Individual) for the appropriate sample unit number on the "Major" chart;

2) Plot this value on the corresponding horizontal line on the chart using an "X" placed directly on the line in the center portion of the sample unit column;

3) Calculate the cumulative total after each sample unit and record in the box opposite "Cum." (Cumulative) under the appropriate sample unit;

Do not plot Cumulative values.

4) Count the number of Minor defects and add this value to the sample unit numbers of Critical, Severe, and Major;

5) Record the value obtained in (4) above and record in the box opposite "Ind." under the appropriate sample unit number on the "Total" chart;

6) Plot this value on the appropriate horizontal line for the sample unit as explained for "Major"; and

7) Calculate and record the cumulative values for each sample unit.

8.3 Interpretation of Plottings and Values

AL values (absolute limit) and acceptance values are listed on the control chart for each defect class for size and quality factors.

The dash lines on the Major and Total control charts represent the AL values for the respective defect class. These are identical in the left-hand margin of the chart by "AL-A" and "AL-B" meaning the absolute limit for Grade A and the absolute limit for Grade B respectively.

A lot may be accepted for a specific grade provided:

1) The number of defects for any individual sample unit does not exceed the AL value for the defect class and grade. (In the case of Major and Total this may be readily determined by checking to see that no plotted value "X" is above the AL line for the grade);

2) The cumulative number of defects does not exceed the cumulative acceptance number for the defect class, sample sizes and grades;

3) The flavor and odor are normal; and

4) The amount of loose material, where applicable, does not exceed the allowance for such material for the grade.

8.4 Code Segregation

In the case of in-plant inspection, if at any time during a production a lot fails, the entire production shall fail unless * the offending portion can be segregated.

*

When a lot is segregated, all values for sample units applicable to the failed, segregated portion are taken off the Tally Sheet or Control Chart, the remaining portions put together, and all cumulative totals recalculated for the remaining portions only. The acceptance criteria is again applied to remaining portions.

* Change.

9. CERTIFICATION

Follow general certification procedures as outlined in File Code 165. The following information shall be included in the body of formal certificates, together with usual information on net weights:

Type - (All Green or Green-White)
Style - (Spears, Tips, Cuts, etc.)
Size - (In the case of Spears or Tips)
Count - (Spears and Tips at request of applicant)
Percent Head Material - (Cut Spears if requested)
Length of Cut - (Cut Spears and Cuts)

9.1 Sizes

In the case of Size for Spears and Tips, it is possible to have several situations. Be guided by the following:

(1) Single Sizes -- If the sample meets the acceptance criteria for a single size, certify such size as:

Size -Medium

(2) Blend of Sizes -- If the sample fails the acceptance criteria for a single size but meets the criteria for blends of sizes, either two or therr adjacent sizes, certify as follows:

Size - Blend of Sizes (Medium and Large)
or
Size - Blend of Sizes (Small, Medium, and Large)

(3) Mixture of Sizes -- If the sample fails the acceptance criteria for both a single size and a blend of sizes, certify as follows:

Size - Mixture of Sizes (Small, Medium, Large, and
or Extra Large)
Size - Mixture of Sizes (Small and Large)

(4) If the applicant requests a further breakdown of sizes by sample units, they may be certified as follows:

Size - Blend of Sizes
4 sample units -- Medium
2 sample units -- Medium-Small blend
or
Size - Blend of Sizes
7 sample units -- Medium
6 sample units -- Large

(5) Follow usual "flagging" procedures whenever the product is graded against a specification with definitive size requirements and the sample fails to meet these requirements.

9.2 Quality Criteria

If the sample as a whole fails to measure up to quality criteria of a contract or specification, indicate the reason for the failure as --

U.S. Grade B, account excess loose material.

10. BUYER SPECIFICATIONS

It is possible that considerable inspection of frozen asparagus will be on the basis of buyers' specifications. As with any other product, it is satisfactory to inspect and certify on the basis of these specifications provided that --

1) A copy of the written specification is available to the inspector.

2) The inspector is able to interpret the specification.

3) There is no conflict with Branch policy.

Some of the common variations built into buyer specs deal with sizing requirements, length of Spear or Cut, limitations on white butts, re-definitions of quality defects. If the specification uses AQL's other than those included in the grade standards, it will be necessary that appropriate tables of acceptance numbers be a part of the package given the inspector. The same policy applies to any classification of defects that are different than those provided in the grade standards.

[Reserved for future developments]

STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS

1. 2.

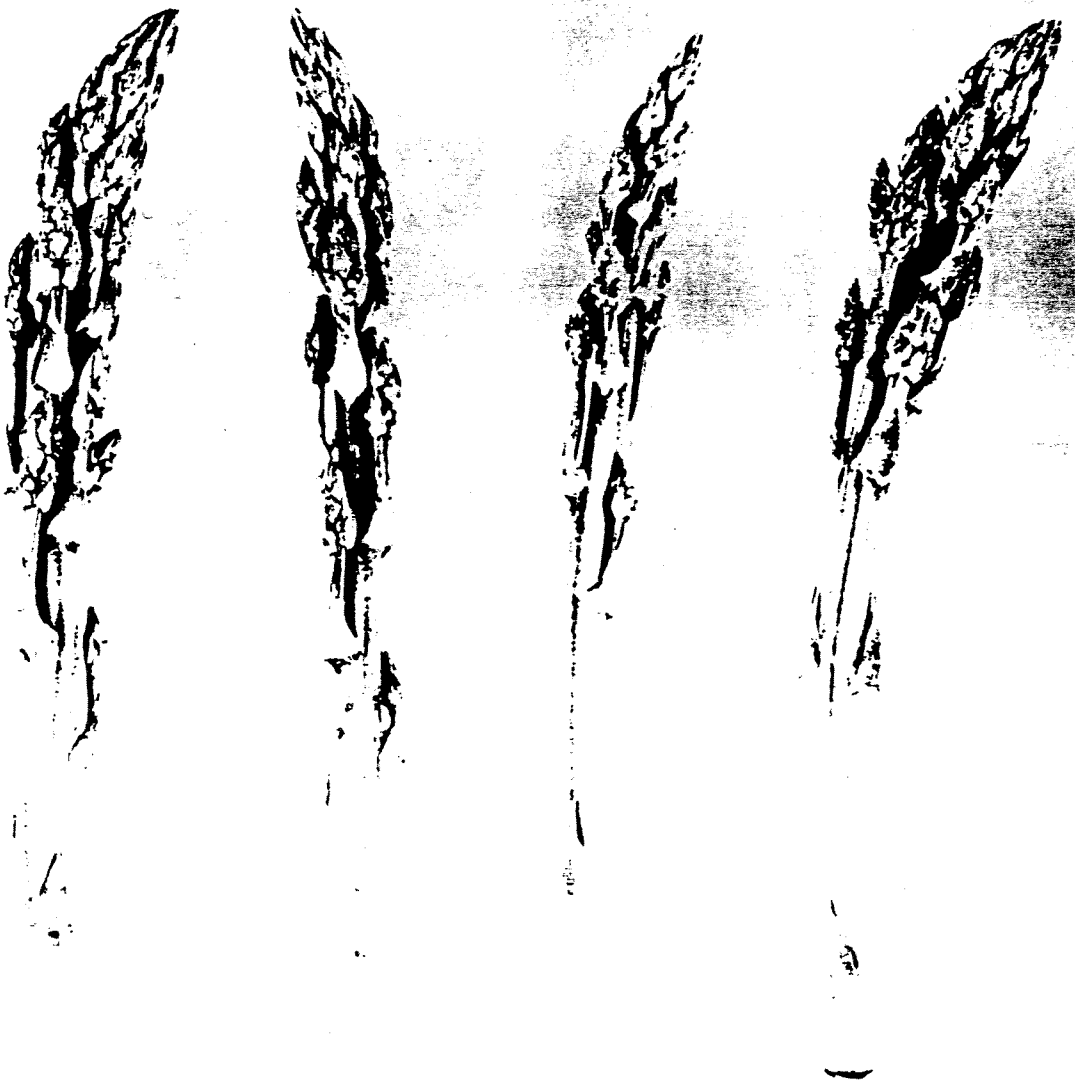
PLATE 1

SPEARS SHOW LOWER LIMIT FOR WELL DEVELOPED HEADS

U.S. DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH

(Reserved for future developments)

STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS



3. 4. 5. 6.

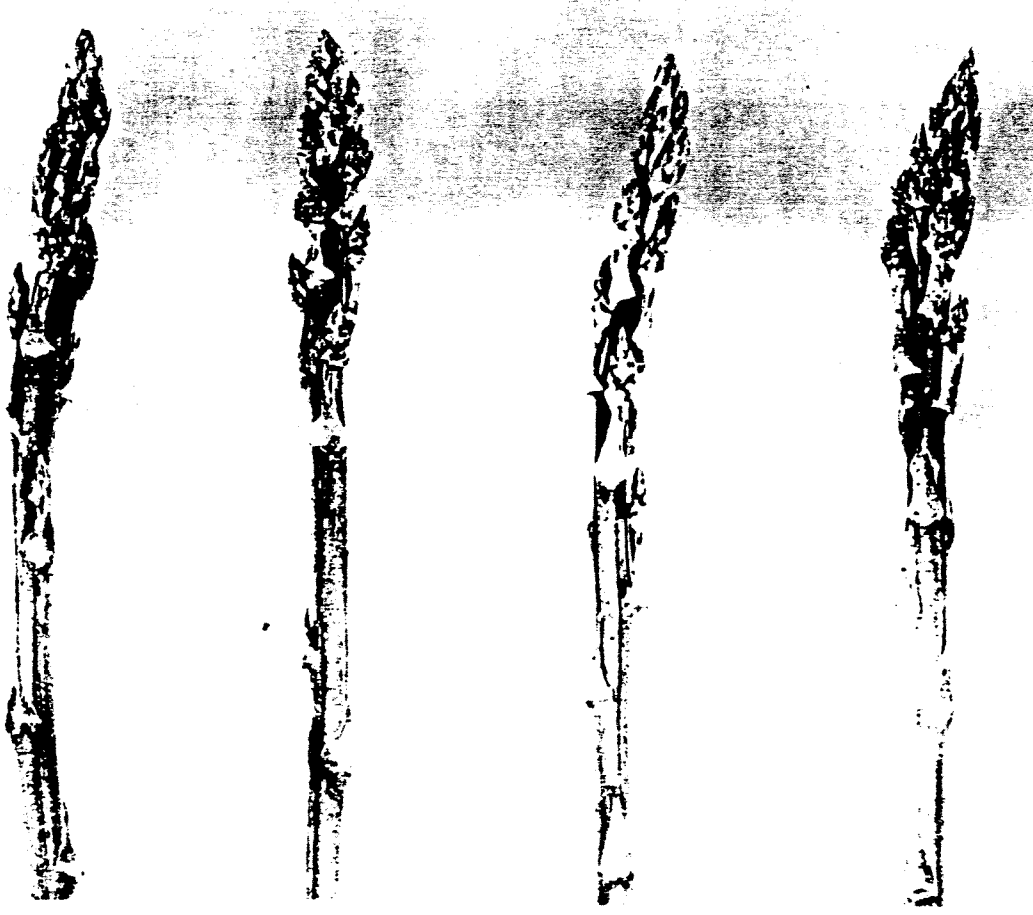
PLATE 2

SPEARS SHOW LOWER LIMIT FOR REASONABLY WELL DEVELOPED HEADS

U.S. DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH

(Reserved for future developments)

STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS



7. 8. 9. 10.

PLATE 3

SPEARS SHOW LOWER LIMIT FOR REASONABLY WELL DEVELOPED HEADS

U.S. DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH

(Reserved for future developments)

FORM FV-356-184 16-1-701

U.S. DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION

DEFECT TALLY SHEET FOR FROZEN ASPARAGUS

NAME AND ADDRESS OF APPLICANT: Blando's Frozen Food Co. Buddington, U.S.A.

STYLE: ☒ SPEARS ☐ CUT SPEARS ☐ CENTER CUTS ☐ TIPS — CODE

DATE: 3-26-70 — INSPECTOR: H.H.W. — GRADE: B

TYPE: Green — LENGTH OF CUT: 5"

NO., SIZE AND KIND OF CONTAINER: 2½ lb. Carton

LABEL: Astro Brand Jumbo Asparagus Spears.

		1				2				3				4				5				6				7				8				9			
CONTAINER MARK		10D6A				10D6B				10D6C				10D6D				10D6F				10D6G															
NET WEIGHT		40.3				40.2				40.6				40.7				40.6				40.4															
Sample Unit No.		1				2				3				4				5				6				7				8				9			
DEFECT		Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.
COLOR	White or yellowish-white		1				2				2				2								1														
UNIFORMITY OF LENGTH	Varies > 1-1/2 in.					1								1																							
	Length < ½"; > 2"																																				
DAMAGE	Shattered heads	2				2				2				1				3				3															
	Misshapened									1																											
	Poorly cut					1								1																							
	Discolored																																				
	Mechanical	1																2																			
	Pathological	3				1	2			3				1	1																						
	Other																																				
HARMLESS EXTRANEOUS MATERIAL																																					
CHARACTER	Reasonably well developed	1								1				1				1				1															
	Poorly developed																																				
	Fiber	3				3	1			4				3				2				2															
TOTAL (Each class)		10	1	—		8	5	—		11	2	—		8	3	—		8	—	—		6	1														
CUMULATIVE TOTAL (Each class)		10	1	—		18	6	—		29	8	—		37	11	—		45	11	—		51	12														
TOTAL (All classes)		11				13				13				11				8				7															
CUMULATIVE TOTAL (All classes)		11				(24)				37				48				56				63															
SIZE (Discolored)		2	(12)	—		1	4	—		1	5	—		4	3	—		6	5	—		5	2	—													
CUMULATIVE TOTAL (Each class)		2	12	—		3	(16)	—		4	(21)	—		8	24	—		14	29	—		19	31	—													
TOTAL (All classes)		(14)				5				6				7				11				7															
CUMULATIVE TOTAL (All classes)		14				19				25				32				43				50															
% LOOSE MATERIAL		0.2				0.4				0				0				0.1				0															
PERCENT HEAD MATERIAL																																					
FLAVOR AND ODOR		Good				—				—				—				—				—															
REMARKS:																																					

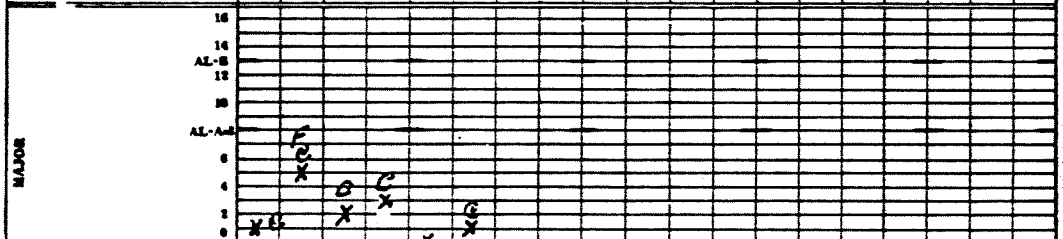
(Reserved for future developments)

FORM FV-364-154 (REVERSE)

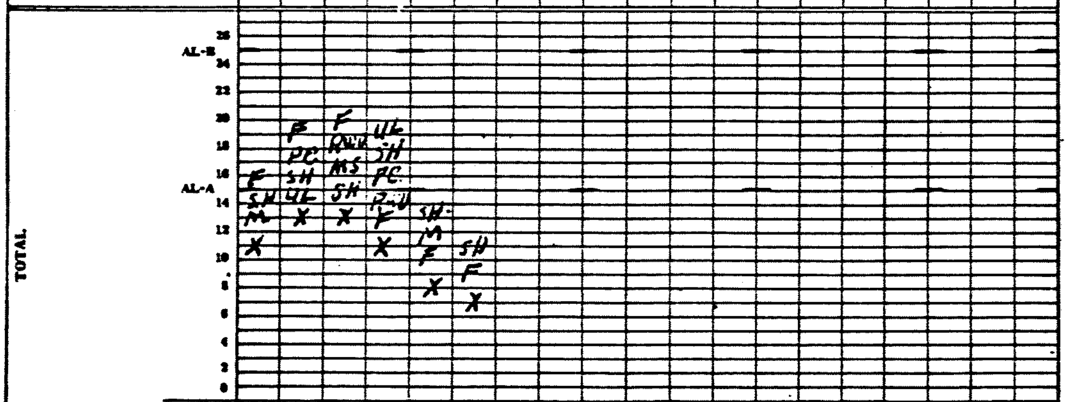
CONTROL CHART *(For Styles of Spears and Tips Only)*

PACKER	LOCATION	STYLE	CONTAINER SIZE	CODE
Blando's Frozen Food Co.	Buddington U.S.A	Spears	2 1/2 lb.	00462E

	Sample Unit No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SINGLE SIZE																				
MAJOR	Ind.	(12)	4	5	3	5	2													
	Cum.	12	(16)	(21)	24	29	31													
	AL=10	7	13	18	22	27	32	36	41	45	50	54	59	63	68	72	76	81	85	90
SEVERE	Ind.																			
	Cum.																			
	AL=5	3	5	7	9	10	12	14	15	17	18	20	21	23	24	26	27	29	30	32
TOTAL	Ind.	(14)	5	6	7	11	7													
	Cum.	14	19	25	32	43	50													
	AL=15	12	21	30	39	47	55	63	72	80	88	96	104	112	121	129	140	145	153	161
QUALITY FACTORS																				
CRITICAL	Ind.																			
	Cum.																			
	AL-B=2	1*	2*	2	3*	4	4*	5	5*	6	6*	7	7*	8	8*	9	9	9*	10	10*
SEVERE	Ind.																			
	Cum.																			
	AL-A=5	3	5	7	9	10	12	14	15	17	18	20	21	23	24	26	27	29	30	32
	AL-B=8	6	11	15	19	23	27	30	34	38	42	45	49	53	56	60	64	67	71	74



		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MAJOR	Ind.	1	5	2	3	0	1													
	Cum.	1	6	8	11	11	12													
	AL-A=8	6	11	15	19	23	27	30	34	38	42	45	49	53	56	60	64	67	71	74
	AL-B=13	10	18	25	33	40	47	54	61	68	76	81	88	95	102	109	117	122	129	136



		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TOTAL	Ind.	11	13	13	11	8	7													
	Cum.	11	(24)	37	48	56	63													
	AL-A=15	12	21	30	39	47	55	63	72	80	88	96	104	112	121	129	140	145	153	161
	AL-B=23	20	37	53	68	84	99	114	130	145	165	175	190	204	219	234	249	264	278	293
Flavor & Flavor & Odor		OK	✓	✓	✓	✓	✓													
% Loose Material		0.2	0.4	0	0	0.1	0													
Period Code or Time		0845	0930	0950	0930	0945	1010													

SIZE DESIGNATION	FINAL GRADE	DATE	INSPECTOR
Jumbo	B	3/31/70	J. Hill

ABBREVIATION KEY

- AL - Absolute limit
- Cum. - Cumulative totals
- Ind. - Individual sample unit
- AQL - Acceptable quality level
- C - Color
- UL - Uniformity of length
- SH - Shattered heads
- MS - Misshapen
- PC - Poorly cut
- D - Discolored
- M - Mechanical damage
- W - Woody
- RWD - Reasonably well developed
- PD - Poorly developed
- F - Fiber
- HEVM - Harmless extraneous vegetable material

(Reserved for future developments)

TABLE III

TOLERANCES FOR SIZE COMPLIANCE		SINGLE SIZES			BLENDS OF SIZES
		Maximum Defects Permitted			
In any Sample Unit (AL) 1/		5	10	15	10
Number of Sample Units	Number of Spears or Tips	Severe	Major	TOTAL 2/	Minor or TOTAL 3/
		In the Total Sample			In the Total Sample
1	50	3	7	12	7
2	100	5	13	21	13
3	150	7	18	30	18
4	200	9	22	39	22
5	250	10	27	47	27
6	300	12	32	55	32
7	350	14	36	63	36
8	400	15	41	72	41
9	450	17	45	80	45
10	500	18	50	90	50
11	550	20	54	96	54
12	600	21	59	104	59
13	650	23	63	112	63
14	700	24	68	121	68
15	750	26	72	129	72
16	800	27	76	140	76
17	850	29	81	145	81
18	900	30	85	153	85
19	950	32	90	161	90
20	1000	33	94	169	94
21	1050	35	98	177	98

1/ In any sample unit, except the first one of 50 Spears or Tips.

2/ "Total" -- the sum of "Severe", "Major", and "Minor" defects, as applicable.

3/ In "Blends of Sizes", "Minor" and "Total" defects are the same.

(Reserved for future developments)

TABLE III -- Continuation of Sample Unit Sizes

TOLERANCES FOR SIZE COMPLIANCE		SINGLE SIZES			BLENDS OF SIZES
		Maximum Defects Permitted			
In any Sample Unit (AL) 1/		5	10	15	10
Number of Sample Units	Number of Spears or Tips	Severe	Major	TOTAL 2/	Minor or TOTAL 3/
		In the Total Sample			In the Total Sample
22	1100	36	103	185	103
23	1150	37	107	192	107
24	1200	39	111	200	111
25	1250	41	116	208	116
26	1300	42	120	216	120
27	1350	43	124	224	124
28	1400	45	129	232	129
29	1450	46	133	240	133
30	1500	47	137	248	137
31	1550	49	142	256	142
32	1600	50	146	264	146
33	1650	52	150	271	150
34	1700	53	154	279	154
35	1750	54	159	287	159
36	1800	56	163	295	163
37	1850	57	167	303	167
38	1900	59	171	311	171

1/ In any sample unit, except the first one of 50 Spears or Tips.
2/ "Total" -- the sum of "Severe", "Major", and "Minor" defects, as applicable.
3/ In "Blends of Sizes", "Minor" and "Total" defects are the same.

(Reserved for future developments)

TABLE III -- Continuation of Sample Unit Sizes

TOLERANCES FOR SIZE COMPLIANCE		SINGLE SIZES			BLENDS OF SIZES
		Maximum Defects Permitted			
In any Sample Unit (AL) 1/		5	10	15	10
Number of Sample Units	Number of Spears or Tips	Severe	Major	TOTAL 2/	Minor or TOTAL 3/
		In the Total Sample			In the Total Sample
39	1950	60	176	318	176
40	2000	62	180	326	180
41	2050	63	184	334	184
42	2100	64	188	342	188
43	2150	66	193	350	193
44	2200	67	197	358	197
45	2250	68	201	365	201
46	2300	70	205	373	205
47	2350	71	210	381	210
48	2400	72	214	389	214
49	2450	74	218	397	218
50	2500	75	222	404	222

1/ In any sample unit, except the first one of 50 Spears or Tips.
2/ "Total" -- the sum of "Severe", "Major", and "Minor" defects, as applicable.
3/ In "Blends of Sizes", "Minor" and "Total" defects are the same.

(Reserved for future developments)

UNITED STATES STANDARDS FOR GRADES OF FROZEN ASPARAGUS
(As amended April 1970) TABLE VII

GRADE COMPLIANCE Spears; and Tips		U. S. GRADE A				U. S. GRADE B			
		Maximum Defects Permitted							
In any Sample Unit (AL) 1/		0	5	8	15	2	8	13	25
Number of Sample Units	Number of Spears or Tips	Critical	Severe	Major	TOTAL 2/	Critical	Severe	Major	TOTAL 2/
		In the Total Sample				In the Total Sample			
1	50	0	3	6	12	1	6	10	20
2	100	0	5	11	21	2	11	18	37
3	150	0	7	15	30	3	15	25	53
4	200	0	9	19	39	3	19	33	68
5	250	0	10	23	47	4	23	40	84
6	300	0	12	27	55	4	27	47	99
7	350	0	14	30	63	5	30	54	114
8	400	0	15	34	72	5	34	61	130
9	450	0	17	38	80	6	38	68	145
10	500	0	18	42	90	6	42	76	159
11	550	0	20	45	96	7	45	81	175
12	600	0	21	49	104	7	49	88	190
13	650	0	23	53	112	8	53	95	204
14	700	0	24	56	121	8	56	102	219
15	750	0	26	60	129	9	60	108	234
16	800	0	27	64	140	9	64	117	249
17	850	0	29	67	145	9	67	122	264
18	900	0	30	71	153	10	71	129	278
19	950	0	32	74	161	10	74	136	293
20	1000	0	33	78	169	11	78	142	308
21	1050	0	35	81	177	11	81	149	322

1/ In any sample unit, except the first one of 50 spears or tips.

2/ "Total" -- the sum of "Critical", "Severe", "Major", and "Minor" defects, as applicable.

(Reserved for future developments)

TABLE VII -- Continuation of Sample Unit Sizes

GRADE COMPLIANCE Spears; and Tips		U. S. GRADE A				U. S. GRADE B			
		Maximum Defects Permitted							
In any Sample Unit (AL) 1/		0	5	8	15	2	8	13	25
Number of Sample Units	Number of Spears or Tips	Critical	Severe	Major	TOTAL 2/	Critical	Severe	Major	TOTAL 2/
		In the Total Sample				In the Total Sample			
22	1100	0	36	85	185	12	85	156	333
23	1150	0	37	88	192	12	88	162	347
24	1200	0	39	92	200	12	92	169	362
25	1250	0	41	95	208	13	95	176	376
26	1300	0	42	99	216	13	99	182	391
27	1350	0	43	102	224	14	102	189	405
28	1400	0	45	106	232	14	106	195	420
29	1450	0	46	109	240	15	109	202	434
30	1500	0	47	113	248	15	113	209	449
31	1550	0	49	117	256	15	117	215	463
32	1600	0	50	120	264	16	120	222	478
33	1650	0	52	124	271	16	124	228	492
34	1700	0	53	127	279	17	127	235	506
35	1750	0	54	131	287	17	131	242	521
36	1800	0	56	134	295	17	134	248	535
37	1850	0	57	138	303	18	138	255	550
38	1900	0	59	141	311	18	141	261	564

1/ In any sample unit, except the first one of 50 spears or tips.

2/ "Total" -- the sum of "Critical", "Severe", "Major", and "Minor" defects, as applicable.

(Reserved for future developments)

TABLE VII -- Continuation of Sample Unit Sizes

GRADE COMPLIANCE Spears; and Tips		U. S. GRADE A				U. S. GRADE B			
		Maximum Defects Permitted							
In any Sample Unit (AL) 1/		0	5	8	15	2	8	13	25
Number of Sample Units	Number of Spears or Tips	Critical	Severe	Major	TOTAL 2/	Critical	Severe	Major	TOTAL 2/
		In the Total Sample				In the Total Sample			
39	1950	0	60	145	318	19	145	268	579
40	2000	0	62	148	326	19	148	274	593
41	2050	0	63	152	334	19	152	281	607
42	2100	0	64	155	342	20	155	287	622
43	2150	0	66	159	350	20	159	294	636
44	2200	0	67	162	358	21	162	301	651
45	2250	0	68	166	365	21	166	307	665
46	2300	0	70	169	373	21	169	314	679
47	2350	0	71	172	381	22	172	320	694
48	2400	0	72	176	389	22	176	327	708
49	2450	0	74	179	397	23	179	333	723
50	2500	0	75	183	404	23	183	340	737

1/ In any sample unit, except the first one of 50 spears or tips.

2/ "Total" -- the sum of "Critical", "Severe", "Major", and "Minor" defects, as applicable.

(Reserved for future developments)

TABLE VIII

GRADE COMPLIANCE Cut Spears; and Cuts		U. S. GRADE A				U. S. GRADE B			
		Maximum Defects Permitted							
In any Sample Unit (AL) 1/		0	7	14	25	3	14	22	44
Number of Sample Units	Number of Cuts	Critical	Severe	Major	TOTAL 2/	Critical	Severe	Major	TOTAL 2/
		In the Total Sample				In the Total Sample			
1	100	0	5	11	21	2	11	18	37
2	200	0	9	19	39	3	19	33	68
3	300	0	12	27	55	4	27	47	99
4	400	0	15	34	72	5	34	61	130
5	500	0	18	42	90	6	42	76	160
6	600	0	21	49	104	7	49	88	190
7	700	0	24	56	121	8	56	102	219
8	800	0	27	64	140	9	64	117	249
9	900	0	30	71	153	10	71	129	278
10	1000	0	33	78	169	11	78	142	308
11	1100	0	36	85	185	12	85	156	337
12	1200	0	39	92	200	12	92	169	366
13	1300	0	42	99	216	13	99	182	396
14	1400	0	45	106	232	14	106	195	425
15	1500	0	47	113	248	15	113	209	454
16	1600	0	50	120	264	16	120	222	483
17	1700	0	53	127	279	17	127	235	512
18	1800	0	56	134	295	17	134	248	541
19	1900	0	59	141	311	18	141	261	570
20	2000	0	62	148	326	19	148	274	599
21	2100	0	64	155	342	20	155	287	628

1/ In any sample unit, except the first one of 100 cuts.
2/ "Total" -- the sum of "Critical", "Severe", "Major", and "Minor" defects, as applicable.

(Reserved for future developments)

TABLE VIII -- Continuation of Sample Unit Sizes

GRADE COMPLIANCE Cut Spears; and Cuts		U.S. Grade A				U.S. Grade B			
		Maximum Defects Permitted							
In any Samply Unit (AL) 1/		0	7	14	25	3	14	22	44
Number of Sample Units	Number of Cuts	Critical	Severe	Major	TOTAL 2/	Critical	Severe	Major	TOTAL 2/
		In the total sample				In the total sample			
22	2200	0	67	162	358	21	162	301	651
23	2300	0	70	169	373	21	169	314	679
24	2400	0	72	176	389	22	176	327	708
25	2500	0	75	183	404	23	183	340	737
26	2600	0	78	190	420	24	190	353	766
27	2700	0	81	197	436	24	197	366	794
28	2800	0	83	203	451	25	203	379	823
29	2900	0	86	210	467	26	210	392	852
30	3000	0	89	217	482	27	217	405	880
31	3100	0	92	224	498	28	224	418	909
32	3200	0	94	231	513	28	231	431	938
33	3300	0	97	238	529	29	238	444	966
34	3400	0	100	245	544	30	245	457	995
35	3500	0	102	252	560	31	252	470	1024
36	3600	0	105	258	575	31	258	483	1052
37	3700	0	108	265	591	32	265	496	1081
38	3800	0	111	272	606	33	272	509	1110

1/ In any sample unit, except the first one of 100 cuts.
2/ "Total" -- the sum of "Critical", "Severe", "Major", and "Minor" defects, as applicable